Claims

We claim:

1. A method for determining the airflow through an air preconditioning module having a sensible and/or latent energy transfer matrix in which there is a pre-established relationship between the airflow through the matrix and the pressure drop across the matrix, the air preconditioning module having a first means for processing an inlet air stream so that it becomes a uniformly distributed and substantially laminar outlet air stream, said method comprising the steps of:

(a) feeding an inlet air stream through the air preconditioning module;

(b) processing the inlet air stream using the first means so that the inlet air stream becomes a uniformly distributed and substantially laminar outlet air stream exiting the energy transfer matrix of the preconditioning module;

(c) determining the pressure differential between the inlet air stream and the outlet air stream; and

(d) translating the pressure differential into an airflow value based on the pre-established relationship between airflow through and pressure drop across the energy transfer matrix of the air preconditioning module.

2. The method of claim 1 wherein the air preconditioning module has been installed as part of an air handling system for a space and the pre-established relationship between airflow and pressure drop is determined prior to the installation.

3. The method of claim 1 wherein the pressure differential is determined using first pressure tubing having an open proximate end in the inlet air stream and second pressure tubing having an open proximate end in the outlet air stream, each of the first and

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second pressure tubing having a distal end, the distal ends of the first and second pressure tubing being connected to a device for determining the pressure differential between the two distal ends.

4. The method of claim 3 wherein the open proximate ends of the first and second pressure tubing are aligned perpendicular to the direction of the airflow in the inlet and outlet air streams, respectively.

5. The method of claim 3 wherein the open proximate ends of the first and second pressure tubing are aligned parallel with the direction of the airflow in the inlet and outlet air streams, respectively.

6. The method of claim 5 wherein the open proximate ends of the first and second pressure tubing are facing in the direction of the airflow in the inlet and outlet air streams, respectively.

7. The method of claim 3 wherein the device for determining the pressure differential indicates the volumetric flow rate through the air preconditioning module.

8. The method of claim 3 wherein the device for determining the pressure differential is a diaphragm gauge or manometer.

9. The method of claim 3 wherein the device for determining the pressure differential comprises a pressure transducer and the distal ends of the first and second pressure tubing are connected to the pressure transducer.

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10. The method of claim 3 further comprising the steps of converting the pressure differential to an electronic signal and transmitting the electronic signal to a building HVAC management system or display remote from the air preconditioning module.

11. The method of claim 10 further comprising the step of indicating if the airflow through the air preconditioning module falls below a predefined threshold value.

12. The method of claim 10 where the steps of determining and converting the pressure differential and transmitting the electronic signal are performed continuously while the air preconditioning module is in operation.

13. The method of claim 10 where the steps of determining and converting the pressure differential and transmitting the electronic signal are performed intermittently while the air preconditioning module is in operation.

14. The method of claim 12 further comprising the step of continuously reporting the airflow value represented by the electric signal.

15. The method of claim 12 further comprising the steps of averaging the electronic signals over a period of time and reporting the airflow value represented by the averaged electric signal.

16. The method of claim 1 wherein the pre-established relationship between airflow and pressure drop through the air preconditioning module is essentially linear.

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17. The method of claim 1 wherein the matrix of the air preconditioning module comprises an energy recovery wheel having a sensible and latent energy exchange media capable of removing heat and moisture from the inlet air stream and the wheel comprises the first means for processing the inlet air stream so that it becomes the uniformly distributed and substantially laminar outlet air stream.

18. A method for determining the quantity of outdoor air delivered to a conditioned space in which the outdoor air passes through an air preconditioning module having a sensible and/or latent energy transfer matrix and becomes a supply air stream before entering the conditioned space and in which there is a pre-established relationship between airflow through the matrix and pressure drop across the matrix, the air preconditioning module having a first means for processing an outdoor air stream so that it becomes a uniformly distributed and substantially laminar supply air stream, said method comprising the steps of:

(a) feeding an outdoor air stream through the air preconditioning module;

(b) processing the outdoor air stream using the first means so that the outdoor air stream becomes a uniformly distributed and substantially laminar supply air stream exiting the energy transfer matrix of the preconditioning module;

(c) determining the pressure differential between the outdoor air stream and the supply air stream; and

(d) translating the pressure differential into an airflow value based on the pre-established relationship between airflow through and pressure drop across the matrix of the air preconditioning module.

19. The method of claim 18 wherein the air preconditioning module has been installed as part of an air handling system for the conditioned space and the pre-established

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relationship between airflow and pressure drop is determined prior to the installation.

20. The method of claim 18 wherein the pressure differential is determined using first pressure tubing having an open proximate end in the outdoor air stream and second pressure tubing having an open proximate end in the supply air stream, each of the first and second pressure tubing having a distal end, the distal ends of the first and second pressure tubing being connected to a device for determining the pressure differential between the two distal ends.

21. The method of claim 20 wherein the open proximate ends of the first and second pressure tubing are aligned perpendicular to the direction of the airflow in the outdoor and supply air streams, respectively.

22. The method of claim 20 wherein the open proximate ends of the first and second pressure tubing are aligned parallel with the direction of the airflow in the outdoor and supply air streams, respectively.

23. The method of claim 20 wherein the open proximate ends of the first and second pressure tubing are facing in the direction of the airflow in the outdoor and supply air streams, respectively.

24. The method of claim 20 wherein the device for determining the pressure differential indicates the volume of airflow through the air preconditioning module.

25. The method of claim 20 wherein the device for determining the pressure differential is a diaphragm gauge or manometer.

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26. The method of claim 20 wherein the device for determining the pressure differential comprises a pressure transducer and the distal ends of the first and second pressure tubing are connected to the pressure transducer.

27. The method of claim 20 further comprising the steps of converting the pressure differential to an electronic signal and transmitting the electronic signal to a building HVAC management system or display mounted remote from the air preconditioning module.

28. The method of claim 27 further comprising the step of indicating if the airflow through the air preconditioning module falls below a predefined threshold value.

29. The method of claim 27 where the steps of determining and converting the pressure differential and transmitting the electronic signal are performed continuously while the air preconditioning module is in operation.

30. The method of claim 27 where the steps of determining and converting the pressure differential and transmitting the electronic signal are performed intermittently while the air preconditioning module is in operation.

31. The method of claim 29 further comprising the step of continuously reporting the airflow value represented by the electric signal.

32. The method of claim 29 further comprising the steps of averaging the electronic signals over a period of time and reporting the airflow value represented by the

averaged electric signal.

33. The method of claim 18 wherein the pre-established relationship between airflow and pressure drop through the air preconditioning module is essentially linear.

34. The method of claim 18 wherein the matrix of the air preconditioning module comprises an energy recovery wheel having a sensible and latent energy exchange media capable of removing heat and moisture from the outdoor air stream and the wheel comprises the first means for processing the outdoor air stream so that it becomes the substantially laminar supply air stream.

35. A method for determining the quantity of return air exiting a conditioned space in which the return air passes through an air preconditioning module having a sensible and/or latent energy transfer matrix and becomes an exhaust air stream discharged from the conditioned space and in which there is a pre-established relationship between airflow through the matrix and pressure drop across the matrix, the air preconditioning module having a first means for processing the return air stream so that it becomes a uniformly distributed and substantially laminar exhaust air stream, said method comprising the steps of:

(a) feeding a return air stream through the air preconditioning module;

(b) processing the return air stream in the air preconditioning module using the first means so that the return air stream becomes a uniformly distributed and substantially laminar exhaust air stream exiting the matrix of the preconditioning module;

(c) determining the pressure differential between the return air stream and the exhaust air stream; and

(d) translating the pressure differential into an airflow value based on the pre-

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established relationship between airflow through and pressure drop across the matrix of the air preconditioning module.

36. The method of claim 35 wherein the air preconditioning module has been installed as part of an air handling system for the conditioned space and the pre-established relationship between airflow and pressure drop is determined prior to the installation.

37. The method of claim 35 wherein the pressure differential is determined using first pressure tubing having an open proximate end in the return air stream and second pressure tubing having an open proximate end in the exhaust air stream, each of the first and second pressure tubing having a distal end, the distal ends of the first and second pressure tubing being connected to a device for determining the pressure differential between the two distal ends.

38. The method of claim 37 wherein the open proximate ends of the first and second pressure tubing are aligned perpendicular to the direction of the airflow in the return and exhaust air streams, respectively.

39. The method of claim 37 wherein the open proximate ends of the first and second pressure tubing are aligned parallel with the direction of the airflow in the return and exhaust air streams, respectively.

40. The method of claim 37 wherein the open proximate ends of the first and second pressure tubing are facing in the direction of the airflow in the return and exhaust air streams, respectively.

41. The method of claim 37 wherein the device for determining the pressure differential indicates the volume of airflow through the air preconditioning module.

42. The method of claim 37 wherein the device for determining the pressure differential is a diaphragm gauge or manometer.

43. The method of claim 37 wherein the device for determining the pressure differential comprises a pressure transducer and the distal ends of the first and second pressure tubing are connected to the pressure transducer.

44. The method of claim 37 further comprising the steps of converting the pressure differential to an electronic signal and transmitting the electronic signal to a building HVAC management system or display remote from the air preconditioning module.

45. The method of claim 44 further comprising the step of indicating if the airflow through the air preconditioning module falls below a predefined threshold value.

46. The method of claim 44 where the steps of determining and converting the pressure differential and transmitting the electronic signal are performed continuously while the air preconditioning module is in operation.

47. The method of claim 44 where the steps of determining and converting the pressure differential and transmitting the electronic signal are performed intermittently while the air preconditioning module is in operation.

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48. The method of claim 46 further comprising the step of continuously reporting the airflow value represented by the electric signal.

49. The method of claim 46 further comprising the steps of averaging the electronic signals over a period of time and reporting the airflow value represented by the averaged electric signal.

50. The method of claim 35 wherein the pre-established relationship between airflow and pressure drop through the air preconditioning module is essentially linear.

51. The method of claim 35 wherein the matrix of the air preconditioning module comprises an energy recovery wheel having a sensible and latent heat exchange media capable of releasing absorbed sensible and latent heat and moisture into the return air stream and the wheel comprises the first means for processing the return air stream so that it becomes the substantially laminar exhaust air stream.

52. A system for determining the airflow through an air preconditioning module having a sensible and/or latent energy transfer matrix in which there is a pre-established relationship between the airflow through and pressure drop across the matrix, said system comprising;

(a) means for feeding an inlet air stream to the air preconditioning module;

(b) means for processing the inlet air stream so that it becomes a uniformly distributed and substantially laminar outlet air stream while passing through the matrix of the air preconditioning module;

(c) means for measuring pressure differential between the inlet air stream and the

outlet air stream; and

(d) means for translating the pressure differential into an airflow value based on the pre-established relationship between airflow through and pressure drop across the matrix of the air preconditioning module.

53. The system of claim 52 wherein the means for processing the inlet air stream comprises an energy recovery wheel having a sensible and latent heat exchange media capable of removing heat and moisture from the inlet air stream flowing through the air preconditioning module.

54. The system of claim 52 wherein the means for processing the inlet air stream comprises an energy recovery wheel having a sensible and latent heat exchange media capable of releasing absorbed sensible and latent heat and moisture into the outlet air stream flowing through the air preconditioning module.